FAO Fisheries Circular No. 843 FIPP/C843

THE COST AND EARNINGS OF CAPTURE FISHERIES, AQUACULTURE AND LIVESTOCK INDUSTRY - A SELECTIVE ANNOTATED BIBLIOGRAPHY

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THE DOCUMENT

This document aims to provide a starting point in a field where little bibliographical work has been done. It has been compiled on the basis of literature surveys on the FAO Aquatic Sciences and Fisheries Abstracts (ASFA), the Commonwealth Agricultural Bureaux International (CABI), and the International Information System for the Agricultural Science and Technology (AGRIS) databases. Preference has been given to material available in FAO's David Lubin Memorial Library and Fisheries Branch Library.

Flood, R.C. (comp.)
The costs and earnings of capture fisheries, aquaculture and livestock industry. A selective annotated bibliography.
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ABSTRACT

This bibliography aims to facilitate access to recorded experience and data regarding the costs and earnings in fisheries and livestock industry, to stimulate the sharing of information and to broaden knowledge in the field.

W/U 5606

The FAO Fisheries Circular is a vehicle for distribution of short or ephemeral notes, lists, etc., including provisional versions of documents to be issued later in other series.

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INTRODUCTION

The question "What is the cheapest form of animal protein to produce?", is of vital importance for developing countries. Perhaps the most cost-effective and available form of animal protein for developing countries is fish and aquaculture. With this in mind, I was commissioned to compile this bibliography: to gather information on the costs and earnings of capture fisheries, aquaculture, and if possible to make a comparison with the other main source of animal protein, livestock.

References are limited to documents from the developing countries of Asia, Africa, Australasia, and Central and Latin America. Only documents dating from 1980 to the present day were examined.

Bibliographic research was carried out on the FAO, ASFA, AGRIS and CAB databases. Documents included are only those available in the Fisheries Branch Library and the David Lubin Memorial Library at the time of compilation. Many thanks are due to FAO Library staff for their assistance and consultation.

The bibliography is arranged alphabetically by author surname, and in chronological order by year for works by the same author. Corporate authors are named only if the name of a personal author is absent. This should avoid the grouping of too many documents under the FAO heading. To enable users to find material on a particular country or subject, geographical and subject indexes are included.

Full bibliographic details and a short abstract of contents are provided for each entry thereby facilitating identification and retrieval.

The language of the title is assumed to be the only one of the text. However, should a document be published in more than one language or provide abstracts in other languages, this is shown by the following abbreviations: En., Es., Fr., etc. for the language of the document and en., es., fr., etc. for the language of the abstract.

In spite of the extensive research for this bibliography, it does not claim to be comprehensive, but rather to make a start in a field where little study has been done before. Therefore, it will be revised; suggestions from users with regard to additions or changes, with full bibliographic details and a brief abstract, should be sent to: Dr M. Hotta, Senior Fishery Policy and Planning Officer, Fishery Policy and Planning Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla 00100 Rome, Italy.

BIBLIOGRAPHY

1. **ABIODUN, A.,** 1986 Issues in fish farming economics: experiences from some coastal states of Nigeria. Journal of West African Fisheries, 2(1):79-88. 7 ref. En., Fr.

The article analyzes the costs and returns of fish farming in Nigeria. The experiences of various states are examined to see whether any great differences exist.

2. **AFOLABI, A.O.** et al., 1986 An examination of solar and traditionally dried fish in Nigeria. In Proceedings of the FAO Expert Consultation on Fish Technology in Africa. Lusaka, Zambia, 21-25 January 1985. FAO Fisheries Report, (329)Suppl: 235-250.

Makes a comparative cost analysis of processing catfish and tilapia species from Nigerian fresh waters. Processes included traditional smoking, traditional solar drying, oven drying or drying using a University of Ife built solar dryer. The Ife solar dryer was the cheapest on a medium term basis.

3 **AGUERO, M.,** 1987 A bio-economic model of the Peruvian pelagic fishery. In the Peruvian anchoveta and its upwelling ecosystem: three decades of change edited by D. Pauly & L. Tsukayama. ICLARM Studies and Reviews, 15:307-24. 29 ref.

This paper presents an overview of the evolution of the Peruvian fisheries from an economic point of view. The consequences of "El Niño" phenomena on the Peruvian fleet and processing over-capacity, fluctuations of landings and the need for tools to assess economic consequences of alternative conditions in the fishery system are outlined. A mathematical, conditional programming model is presented. A Fisheries Net Benefit Function (FNBP) is proposed which expresses all activities implying costs and revenues. Results from the base model are also presented.

4. **AWADALLAH, M.W.,** 1983 An incomes and costs study of the Egyptian trawl fishery operated in the Gulf of Suez and off the Southern Red Sea Coast during 1980-81. Cairo, Egypt, FAO Project for Development of Fisheries in Areas of the Red Sea and the Gulf of Aden, 38p. RAB/81/002/4. ar., En.

The incomes and costs of the Egyptian trawl fleet operating in the Gulf of Suez and off the southern Red Sea coast from 1980-81 are examined.

5. **BADIO, J.R. & J.W. MILLER,** 1987 Les aspects économiques de la pisciculture en Haïti. In Déroulement du Séminaire sur l'aquaculture en Haïti, edited by L. Garnier and J.W. Miller. Port-au-Prince (Haïti), 14-15 October 1987, p.49-53.

Examines costs involved in the construction of fish ponds and rearing of fish species in Haiti using data obtained in Jamaica. Production figures for various aquaculture systems used in Haiti are given, and the potential for commercial fish farming is examined.

6. **BAILEY, C., A. DWIPONGGO & F. MARAHUDIN,** 1987 The economics of marine fisheries: costs and earnings. In Indonesian marine capture fisheries, ICLARM Studies and Reviews, 10:103-25.

Examines the relevant data from the few available costs and earnings studies on the marine fisheries of Indonesia. Compares these data with data from two extensive socio-economic surveys. The aim is to assess the economic performance of various medium- and small-scale fishing units in Indonesia to judge the profitability of these respective fishing units. The variability in economic performance between and within sub-sectors and even for the same type of gear is also discussed.

7. **BALARIN, J.D.,** 1982 Kenya pioneers intensive tank culture of tilapia. ICLARM Newsletter, 5(1):17-18.

Tilapia tank culture at Baobab farm in Mombasa, Kenya, is described in detail. The economics and prospects of intensive culture in Kenya are considered.

8. **BASUKI, R. et al.,** 1985 Studi mengenai biaya dan penerimaan pengguanaan jaring insang hanyut di jepara, propinsi jawa tengah. (Costs and returns for drift gillnet in Jepara, Central Java Province). Jurnal penelitian perikanan laut. (Journal of Marine Fisheries Research), 33:35-42. 3 ref. In., En.

Examines costs and returns of the drift gillnet fishery in Jepara Regency, Central Java Province.

9. **BELLEMANS, M.S.,** 1983 Les revenus et la rentabilité de différents engins de pêche à Mbour, Dakar (Sénégal), Institut sénégalais de recherches agricoles, 32p. Document scientifique n° 86. Fr., En.

Presents an economic analysis of different artisanal fishing methods: unmotorized canoe with handlines, motorized canoe with gillnet, and motorized canoe with surface gillnet. The study, carried out from July 1980-July 1981, aimed to determine the most profitable fishing gear available in Mbour, Sénégal.

10. **BERKES, F.,** 1986 Local-level management and the common problems: a comparative study of Turkish coastal fisheries. Marine Policy, 10(3):215-29. 66 ref.

Describes work based on five case studies aimed at assessing the economic performance of local-level management among the different fishing sectors along the Turkish coasts. Problems cited include varying levels of catch, variations in fuel use and different amounts of investment. Finally, these problems are discussed from the point of view of their importance for fishery development policies.

11. **BERKES, F., & KISLALIOGIU, M.,** 1989 A comparative study of yield, investment and energy use in small-scale fisheries: some considerations for resource planning. Fisheries Research, 7(3):207-24. 20 ref.

Presents data from sixteen fisheries from the Canadian Pacific, the Great Lakes, England, the Caribbean, Turkey and the Canadian North. These data were used in a comparative analysis of three parameters: fish yields, capital investment, and fuel energy. Results suggest that many small-scale fisheries are not as energy efficient as postulated by some researchers.

12. **BLACK, W.L.,** 1983 Soviet fishery agreements with developing countries. Benefit or burden. Marine Policy, 7(3):163-74.

Examines the provisions of seven intergovernmental fishery agreements between the USSR and developing countries in Africa and adjacent areas. The article describes the impact of the new ocean regime on the Soviet distant water fishing fleet. The USSR-Sierra Leone agreement of 1976 is selected as a typical agreement for analysis and the author estimates costs and benefits of the agreements for the USSR and the developing countries. FAO's EEZ programme is suggested as a more suitable method for developing countries to obtain maximum benefits from their new fishery zones.

13. **BOEUF, G.,** 1986 La salmoniculture au Chili. La pisciculture française, 84:5-35. 36 ref.

The economic potential of development in Chilean salmonidae production is analyzed. The article compares investment and operating costs of salmonidae culture projects in Chile with those of similar projects in Scotland. Both intensive and extensive aquaculture of salmonidae are examined.

14. **BOSTOCK, T., D. KING & J. ESTIVAREZ,** 1984 Economics of production and marketing of some new fish products in Bolivia. Trinidad, (Bolivia), Amazon Fisheries Development Project, 31p. Es., En.

Describes the activities of the Amazon Fisheries project Phase I based in Trinidad. Three types of fish product were developed: hot smoked fish, salted fish cakes, and salted and dried fish; these products were then considered for test marketing in Bolivia. An economic evaluation was undertaken, not to provide a definitive study on their respective feasibility of production, but rather to draw comparisons between the various products and highlight the large difference in variety.

15. **BRAINERD, T.R.,** 1984 Lessons from fisheries development in West Africa: purse seine/trawler construction, Ghana. ICMRD Working Paper, 10. Rhode Island (USA), International Centre for Marine Resource Development, 34p. 84/85-002.

An economic evaluation of the ICMRD Purse Seine/Trawler Construction Project in Ghana is presented. The paper compares the financial data obtained from the operation of the ten vessels constructed by the project with the estimates made during the appraisal of the project.

16. **BRAINERD, T.R.,** 1984 Lessons from fisheries development in West Africa: oyster culture project, Sierra Leone. ICMRD Working Paper, 11. Rhode Island (USA), International Centre for Marine Resource Development, 19p. 84/85-003.

An evaluation of the ICMRD Oyster Culture Project in Sierra Leone is presented. The evaluation includes a brief description of the project, a financial analysis of cultured oyster production by the raft method, a socio-economic evaluation of the project, and a summary of the results.

17. **BRAINERD, T.R.,** 1984 Lessons from fisheries development in West Africa: artisanal fisheries, Senegal. ICMRD Working Paper, 13. Rhode Island (USA), International Centre for Marine Resource Development, 40p. 84/85-005.

Describes and evaluates the motorization, purse seine, and marketing projects in Senegal. Presents a financial analysis of the motorization project. A similar analysis compares the costs and returns to fishermen under three fishing methods: unmotorized with surrounding gillnet, and motorized with purse seine. Discusses the contribution of the projects to national income and gross national product.

18. **BRAINERD, T.R.,** 1989 An evaluation of selected artisanal fisheries projects in Senegal. In Aspects of small-scale fisheries development edited by R.B. Pollnac & M.T. Morrissey. Rhode Island (USA), International Centre for Marine Resource Development, p.75-98. 8 ref.

Describes and evaluates three projects: the motorization, the purse seine, and the marketing project. The costs and returns to fishermen are then compared under three fishing methods: unmotorized, motorized with surrounding gillnet, and motorized with purse seine.

19. **BRUCELAS, M.R.,** 1979 Productivity and profitability of trawlers and purse seiners in Southeast Asia. In Economics of aquaculture, sea fisheries and coastal resource use in Asia edited by A.R. Librero & W.L. Collier. Manila, Philippines, Philippine Council for Agricultural and Resources Research, p.253-60.

Provides detailed information on the productivity and profitability of the different sized fishing vessels in selected ports in Singapore, Malaysia, the Philippines and Thailand. In particular, attention is focussed on the costs and earnings of the fishing units, and production by vessel size.

20. **BUDIHARDJO, Drs. & M. NATSIR NESSA,** 1982 Analisis tingkat produktivitas dan pendapatan usaha penangkapan ikan terbang dengan pakkaja dan gillnet, serta sistem pemasarannya. (The productivity and income analysis of the flying fish fisheries by pakkaja and gillnet, and its marketing system). Laporan Penelitian Perikanan Laut (Marine Fisheries Research Report), 24:111-19. 3 ref. In., En.

Presents a comparative study on technical and economic aspects of the Torani (flying fish) fisheries by drifting portable traps and gillnet in Takalar and Barru (South Sulawesi, Indonesia). Gives the relative profitability of the two gears.

21. **CAMPBELL, H.F. & R.K. LINDNER,** 1989 A note on optimal effort in the Maldivian tuna fishery. Marine Resource Economics, 6(2):173-76. 2 ref.

Argues that spatial considerations and travel costs should be taken into account in devising tax/subsidy regulations for island-based tuna fisheries. In particular, the effects of a landing tax on distant fishing grounds should be considered when setting the level of the tax. A fuel subsidy is suggested as a means of offsetting the impact of the landing tax on marginal grounds.

22. **CAROLS, T.C. IVO, CARLOS G.N. COELHO & COLESTE D.V. DA SILVA,** 1984 Análise bioeconomica da pesca de lagostas no nordeste do Brasil (Bio-economic analysis of the spiny lobster fishery off Brazilian Northeast). Arquivos de Ciencias do Mar, 23:65-73. 4 ref.Pt., En.

Analyzes the bio-economic aspects of the spiny lobster fishery off Brazil. An estimate of total revenue is described from Fox's surplus production model, recorded with total costs being proportional to fishing effort. Three opportunity-cost scenarios were examined: current fleet expenses, the buying price as the trap opportunity, cost and two weighted previous prices.

23. **CENTRAL MARINE FISHERIES RESEARCH INSTITUTE,** 1982 Mechanization of indigenous crafts with outboard motors in Tamil Nadu, India - An impact study. Marine Fisheries Information Service, Technical and Extension Series, 38:17-19.

Presents a study of the impact of mechanization on indigenous crafts in Tamil Nadu, India. Information is provided on the number of vessels fitted with outboard engines; average catch per boat; price rates at landing sites; and the costs and returns of fishing trips in the region.

24. **CHEONG, L. AND W.S. LOY,** 1982 An analysis of the economics of farming green mussels in Singapore using rafts. In Aquaculture Economics Research in Asia: Proceedings of a Workshop held in Singapore, 2-5 June 1981. Ottawa, Canada, IDRC (International Development Research Centre), p.65-74. IDRC 193e.

Raft culture of green mussels in Singapore is described and the economics of various operations are discussed. All the different types of production costs are examined.

25. **CHABOUD, C. AND M. KEBE,** 1986 A note on the improvement of onshore fish handling and distribution in Senegal. In Proceedings of the FAO Expert Consultation on Fish Technology in Africa. Lusaka, Zambia, 21-25 January 1985. FAO Fisheries Report, (329)Suppl.:30-35.

Notes are presented on the improvement of onshore fish handling and distribution in Senegal, including the effects on costs and prices of newly developed storage containers.

26. **CHOI, I.H.,** 1984 Korea's deep-sea fisheries industry. INFOFISH Marketing Digest, 3:10-12.

Discusses the state of the Republic of Korea's deep-sea fisheries before and after the proclamation of the 200 mile EEZs by the world's major coastal countries. Describes the factors which have aggravated the management of Korea's deep-sea fisheries industry since the EEZ: rising licence fees, stiff licensing conditions and slipping export prices for deep-sea marine products. Prospects for the future are reviewed.

27. **CHRISTY, L., R. McMANUS, R. RACKOWE & H. RAMBAUD,** 1983 International joint ventures in fisheries: Case studies from West Africa (CECAF region). Review of joint ventures and other commercial arrangements. Rome, FAO, 143p., GCP/RAF/166/NOR. En., Fr.

The first part of this report contains an evaluation of West African fisheries joint ventures based on case studies that have been reported to FAO over the years. The second part contains the results of an investigation - in the form of case studies - undertaken by the FAO team during their mission.

28. **CLARKE, L.G. & A.J. SLATYER,** 1985 Economic development and management of fisheries in the Exclusive Economic Zones of the Pacific Island States. In The Developing Order of the Oceans: Proceedings of the Law of the Sea Institute Eighteenth Annual Conference, 24-27 October 1984, San Francisco (USA), edited by R.B. Krueger & S.A. Riesenfeld. Honolulu, (Hawaii), Law of the Sea Institute. p.608-13.

Examines Pacific Island government concerns over the management and development of their commercial offshore fisheries resources (skipjack, tuna, and billfish). Concerns fall into three areas: the wish to gain employment, income, government revenue and foreign exchange earnings from industrial fisheries and processing; the need to control foreign fishing in their waters and extract maximum benefits from it by licensing arrangements; the need to coordinate their policies on the exploitation of these species with other states in the region and to develop cooperative relationships with distant-water fishing states over the management of the resources.

29. **COMIA, O.Z.,** 1982 Tilapia breeding - a profitable backyard industry. Fisheries Newsletter, 11(1):70-73.

Reviews the successful breeding of Tilapia nilotica or Nile tilapia undertaken in small backyard fishponds built in irrigated rice fields along the shorelines of Laguna de Bay, Philippines. Costs and returns of these backyard fishponds are provided.

30. **COMIA, O.Z., & E.C. MERCENE,** Pig-cum-tilapia farming. Fisheries Newsletter, 1982 11(3):50-52.

Presents the results and methodology of an experiment aimed at assessing the adaptability and economic viability of technologies for pig-fish culture. Reviews the costs and returns of pig-cum-tilapia farming.

31. **COMITINI, S. & S. HARDJOLUKITO,** Economic benefits and costs of alternative 1986 arrangements for tuna fisheries in the Exclusive Economic Zone: the case of Indonesia. Ocean Management, 10(1):37-55. 36 ref.

Attempts to quantify the economic benefits and costs to the government of Indonesia, as steward over the resources within the EEZ, of choosing between alternative institutional arrangements for tuna fisheries development.

32. **COOPER, A.P., S. CHAMBERS & N. BOYD,** Production of uniform-age male Tilapia 1983 nilotica fingerlings in nursery ponds. In Proceedings of the thirty-fifth Annual Conference of Gulf and Caribbean Fisheries Institute edited by J.B. Higman, Nassau, Bahamas, November 1982. Miami (USA), Gulf and Caribbean Fisheries Institute, p.37-41.

Describes the experimental rearing of Tilapia nilotica fingerlings at ten nursery ponds (0.12 to 0.28 ha) at the government-owned facilities at Mitchell Town and Twickenham park in Jamaica. Detailed production costs of the experiment are provided.

33. **COSTA-PIERCE, B.A.,** Sewage fish cages of Kota Cianjur, Indonesia. NAGA, 1988 11(12):7-9.
Examines the economic benefits of a new aquaculture system for common carp (Cyprinus carpio). Unlike conventional cage culture the sewage cage system of Kota Cianjur does not require high capital inputs.

34. **CORVEST, S.,** L'élevage de la crevette en Equateur. La pêche maritime, 1988 1319:256-62. 5 ref.

Gives a brief history of shrimp culture in Ecuador. Discusses the evolution of culture techniques, and provides data on the economics of this type of culture.

35. **CRUZ, E.M. & M. RIDHA,** Production of marketable-size tilapia, Oreochromis 1990 spirilus (Gunther), in seawater cages using different production schedules. Aquaculture and Fisheries Management, 21(2):187-94. 21 ref.

Considers four different schedules for producing marketable-size tilapia in sea cages in Kuwait. An economic cost and return analysis was conducted to determine the profitability of culturing tilapia using these four schedules. The results of the experiment are provided.

36. **DELMENDO, M.N.,** A review of integrated livestock-fowl fish farming systems. 1980 In Integrated agriculture-aquaculture farming systems: Proceedings of the ICLARM-SEARCA Conference on Integrated

Agriculture-Aquaculture Farming Systems, Manila, Philippines, 6-9 August 1979. ICLARM Conference Proceedings 4, edited by R.S.V. Pullin and Z.H. Shehadeh. Manila, Philippines, ICLARM and Southeast Asian Regional Centre for Graduate Study and Research in Agriculture. p.59-71. 27 ref.

Traditional and current practices in integrated farming are reviewed and show that it is concentrated in Asia. The design of integrated animal-fish units and the formulation of animal feeds are identified as key factors in farm productivity and profitability. Economic analyses are presented from selected examples of pig-fish, chicken-fish and duck-fish farms.

37. **DJUWAYNI, M.T.,** 1985 Tingkat pemerataan pendapatan rumah tangga perikanan di Tanjung Lombok Timur (Nusa Tenggara Barat). (The level of income inequity of fishing households in Tanjung Luar East Lombok (West Nusa Tenggara). Laporan Penelitian Perikanan Laut (Marine Fisheries Research Report), 32:15-18. 9 ref. In., En.

Studies varying levels of income inequity in fishing households in Tanjung Luar East Lombok (Indonesia). Concludes that the inequity of income in fishing households was considered low.

38. **DOMAGALA, M. & K. JAWORSKI,** 1986 Guidelines for the calculation of the comparative costs of animal protein in developing countries. Rome, FAO, 28p. FAO Fisheries Circular 802. En., Fr., Es., Ar.

This document is an edited and adapted version of a study undertaken by economists of the Polish Academy of Warsaw. It contains tables and guidelines for the economic analysis of the alternative costs of producing animal protein foods in developing countries. The animal proteins discussed include fish, poultry, red meat, etc.

39. **DUNN, I.G. & G. OTTE,** 1983 Fisheries development in the Middle Mahakam Area. East Kalimatan Transmigration Area Development Project, TAD - Materialien 13. Samarinda (Indonesia), 121p.

Discusses fishery development in the Middle Mahakam Area of Indonesia. Outlines details of projects designed to improve fishery development; these projects take into account existing problems of costs and returns.

40. **DURAN PAYAN, S.,** 1982 Planteamiento para la investigación económica en acuícultura. Revista Latinoamericana de Acuícultura, 13:31-33. Es., En.

Examines the proposal that aquaculture farms be set up to increase production of animal-based proteins in Mexico. The study presents eight basic points for lowering costs if these projects are carried out.

41. **ENGLE, C.E.,** 1985 Aspectos economicos de la agro-acuícultura en Panamá. Revista Latinoamericana de Acuicultura, 23:7-11. Es., En.

Describes an agropisciculture system associated with livestock production which was developed in Panama. Analyses the economic inversion and evaluates the production costs for such a system to see if the association with livestock was profitable.

42. **ESCOVER, E.M., O.T. SALON & I.R. SMITH,** 1987 The economics of tilapia fingerling production in the Philippines. Aquaculture and Fisheries Management, 18(1):1-13. 8 ref.

These analyses of the tilapia fingerling industry focus on the economics of production in different hatchery systems and on fingerling marketing channels. The relative profitabilities of different hatchery systems (land-based or lake-based) are estimated and economics of scale are examined.

43. **EVERETT, G.V.,** 1989 Small-scale fisheries development issues in West Africa. Benin, FAO Programme for Integrated Development of Artisanal Fisheries in West Africa - IDAF, 48p. IDAF/WP/26. GCP/RAF/192/DEN - GCP/RAF/198/DEN. GCP/RAF/197/NOR. En., Fr.

There are three sections to this report: the first section concerns the important topic of finance for the fisheries subsector; the second section examines the information gained from surveys of fishing activity and fishermen's earnings and their usefulness to decision makers; and the third section highlights some common dilemmas facing administrators of fishery development programmes.

44. **FAGBENRO, O.A.,** 1987 A review of biological and economic principles underlying commercial fish culture. Journal of West African Fisheries, 3(2):171-77. 9 ref.

The economics of commercial fish culture in Nigeria are presented. The variability of production costs is examined especially in reference to species cultivated and system of culture adopted. Biological factors which may affect various production possibilibities are also described.

45. **FARRINGTON, J.,** 1987 Fisheries development in Sri Lanka - an economic perspective. Marga, 9(1):32-51. 2 ref.

The purpose of this paper is to identify the type and approximate value of official support received by marine fishermen, distinguishing nominal from effective subsidies; to measure the cost of this support against the incremental value of catch attributable to the motorization programme, and to suggest cost-effective methods of expanding the marine catch in the future.

46. **FERNANDEZ, M.,** 1985 Developing fisheries in Thailand. INFOFISH Marketing Digest, 1:11-14.

Discusses both the importance of fish as a source of income and as the principal source of animal protein. Examines problems to the further development of the Thai fishing industry; these include 200-mile EEZ limitations, overfishing and rising costs of production.

47. **FLORES, R.B.,** 1985 Aspectos económicos relativos al manipueleo a bordo de pequeños pelágicos para su posterior utilización en alimentación humana. Consulta de expertos sobre technología de productos pesqueros en America Latina, Ciudad de México, 13-16 diciembre de 1983. FAO Fisheries Report, 340(Suppl.):265-72.

Presents economic aspects of on-board processing of small pelagic species in Brazilian waters. Provides processing costs and considers potentially more efficient on-board processing methods.

48. **GALAPITAGE, D.C.,** 1981 Economics of cage culture of tilapia in Sri Lanka. In Aquaculture economics research in Asia: Proceedings of a workshop held in Singapore, 2-5 June 1981, Ottawa, International Development Research Centre (IDRC), p.82-89. IDRC 193e.

Describes preliminary production trials of cage culture of tilapia in Sri Lanka. Evaluates the economic feasibility of cage culture, suggesting various ways of improving its economic feasibility.

49. **GONZALEZ, L.W. & J. CELAYA,** 1986 Diagnostico socio-económico de la pesquería de media altura pargo-mero del estado Nueva Esparta. Universidad de Oriente, Nucleo de Nueva Esparta, Contribuciones Cientifícas, 8:31p. 23 ref. Es., En.

A study of the social and economic aspects of the snapper grouper fisheries of the Island of Margarita, Venezuela. Social welfare and living conditions of the fishermen are not commensurate with the economic benefits they receive from fishing, which is relatively well compensated.

50. **GREBOVAL, D.F.,** 1987 Major economic considerations for the preparation and negotiation of fisheries joint ventures (with special reference to African fisheries). Mahé, Seychelles, FAO Regional project for the Development and Management of Fisheries in the Southwest Indian Ocean. 53p. RAF/79/065/WP/40/87/E.

Examines the major economic issues and some related financial considerations raised in the preparation, negotiation and implementation of fisheries joint ventures by African coastal countries.

51. **GIUDICELLI, M.,** 1984 Financial feasibility study of trawling operations on Saya de Malha Bank. Mahé, Seychelles, FAO Regional Project for the Development and Management of Fisheries in the Southwest Indian Ocean, 38p. 3 ref. RAF/79/065/WP/16/84.

A feasibility study of trawl fishery on Saya de Malha Bank is presented. It is a preliminary study which provides facts, on which to decide the utility of a pilot project requiring a substantial financial investment. Estimated cost figures are provided.

52. **GULBRANDSEN, O.,** 1985 A preliminary account of attempts to introduce alternative types of small craft into West Africa. Benin, FAO Programme for Integrated Development of Artisanal Fisheries in West Africa -

IDAF, 51p. IDAF/WP/3. GCP/RAF/192/DEN. GCP/RAF/198/DEN. GCP/RAF/197/NOR. En., Fr.

An analytical account is given with special reference to Senegal, Guinea-Bissau, Sierra Leone, Côte d'Ivoire, Benin and Nigeria of previous and present attempts to introduce into the important artisanal canoe fisheries of West Africa, alternative types of small craft, new construction materials and engines. Recommendations are made for further sea trials and extended practical operating experience to determine the technical, economic and cultural acceptability of these alternative types of craft.

53. **HAJ RAHMA, I. & G.F. NEWKIRK,** Economics of tray culture of the mother-of-pearl shell pinctada margaritifera in the Red Sea, Sudan. 1987 Journal of the World Aquaculture Society, 18(3):156-61. 4 ref.

Presents an economic analysis of tray cultured oysters in Dongonab Bay, Red Sea, Sudan, based on production costs collected by the Red Sea Fisheries Research Centre.

54. **HANVIVATANAKIT, P.,** Oyester culture in Ranong - Surat Thani offers a model. 1988 Bay of Bengal News, 30:6-7.

Describes the state of oyster culture in Surat Thani province in the Gulf of Thailand. In order to obtain guidelines for commercial operations in Ranong province a costs and earnings study was carried out in Surat Thani on oyster culture under the auspices of the BOBP's Ranong Project.

55. **HATCH, U., S. SINDELAR, D. ROUSE & H. PEREZ,** Demonstrating the use of risk programming for aquacultural farm management: the case of 1987 Penaeid shrimp in Panama. Journal of the World Aquaculture Society, 18(4):260-69. 8 ref.

Describes a risk programming method used to evaluate alternative shrimp-farm management strategies relevant to Panama in terms of income, profitability and risk.

56. **HOPKINS, K.D.,** Outstanding yields and profits from livestock-tilapia integrated farming. 1982 ICLARM Newsletter, 5(3):p.13.

Examines the economic benefits which can be accrued from various livestock-tilapia integrated farming systems in Southeast Asia. It is based on research carried out by ICLARM at the end of 1981 on integrated farming in the region.

57. **INNOCENTI, L. & M. MONTANELLI,** Costi, ricavi ed elementi tecnici dell'allevamento di gamberi in America Latina. 1988 Il Pesce, 5:33-35, p.38.

Discusses shrimp culture in Latin American countries, particularly in Colombia. Information is provided regarding current techniques used in Europe to help personnel in the Latin American shrimp industry decide on which system to use. The costs and returns are examined.

58. INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT, 1981 Alternative energy sources in fisheries and aquaculture. ICLARM Newsletter, 4(2), 28p.

An issue devoted to the ADB/ICLARM Workshop on Appropriate Technology for Alternative Energy Sources in Fisheries. Different ways of reducing escalating fuel costs in fisheries and aquaculture are examined using different forms of renewable energy sources.

59. ISLAM, M.S. & S. DEWAN, 1988 Status and economic efficiency of fish seed multiplication farms in Bangladesh. The Bangladesh Journal of Agricultural Economics, 11(1):69-79. 5 ref.

Examines the status and economic efficiency of Fish Seed Multiplication Farms in Bangladesh. Status and economic efficiency are measured in terms of two indices: production gap between the target and achievement, and the economic returns and causes of their variation.

60. JAHARA, Y. & R.J.G. WELLS, 1982 A case study of costs and earnings of three gears in the Trengganu Fishery, Malaysia. The Developing Economies, 20(1):73-99. 10 ref.

This case study aims to provide data on the costs and earnings of the Trengganu fishery, and is intended to fill a gap that exists in studies of the small sector. Specifically, this study provides information on costs, earnings, and profitability of three selected gears, broadly representative of the Trengganu fishery: small trawl nets, gillnets and handlines.

61. JOHNSEN, T., 1985 Simulations of the profit potential for different boat types introduced as a supplement to or replacement for the schooner fleet of the Seychelles. Mahé, Seychelles, FAO/UNDP Regional Project for the Development and Management of Fisheries in the Southwest Indian Ocean. 25p. 6 ref. RAF/79/065/WP/25/85.

Four new fishing crafts are considered as possible replacements for the traditional schooners of the Seychelles. The report describes computer simulations to assess the economic viability of these vessels taking into account operating, maintenance, and investment costs, together with crew renumeration and a minimum profit margin for the owner. The end result of the evaluation is to assess whether, in the handline, mechanized dropline, and trou fisheries, the purchase price of the boat can be covered.

62. JOSEPH, L., 1989 Tapping the offshore tuna resource: BOBP experiment in Sri Lanka. Bay of Bengal News, 35:17-19.

Discusses the findings of a survey conducted by the Bay of Bengal Programme from 1987 to 1988. The aim of the survey was to aid further expansion and development of the small-scale offshore tuna fishery in Sri Lanka. The survey provided information on the abundance of stocks, catching methods, economics of operations, etc.

63. **KAMAL KUMAR DATTA & S.S. DAN,** 1989 Economics of different craft-gear combinations in Orissa Coast. Seafood Export Journal, 11(5):15-26.

Examines the economics of different craft-gear combinations along the Orissa Coast, India. Explores the possible consequences of mechanization on income distribution between mechanized and non-mechanized fishing units and studies any inequality in the distribution of income between them.

64. **KRISHINA IYER, H., et al.,** 1983 The effect of increase in the number of fishing trips on the economic efficiency of 9.82 m and 11 m fishing trawlers along Kerala coast. Fishery Technology, 20(1):9-12.

Presents a cost benefit analysis of a 9.82 m and 11 m trawlers along Kerala coast, India. Using the number of fishing trips as a basis, possibilities of break-even points for the two types of vessel are provided.

65. **KRONE, W.,** 1979 Fish as food. Present contribution and potential. Food Policy, 4(4):259-68.

Gives an account of the importance of fish as a source of animal protein and as an appreciated food particularly in developing countries. Examines ways of increasing supplies in order to maintain the role of fish. Because the cost of many fish-producing systems is relatively low compared to the cost of producing other sources of animal protein such as beef, poultry, and pigs, increased exploitation of fishery resources for food purposes is possible. However, such a scheme would require international collaboration and financial assistance from developed countries.

66. **KUNZMANN, A.,** 1988 Coral reef longline: an alternative gear for small-scale fishermen? Naga, 11(4):6-7.

Considers the economic potential of an alternative fishing gear, coral reef longline, as a more suitable and cost-effective method of fishing for small-scale fishermen.

67. **KURIEN, J. & R. WILLMANN,** 1982 Economics of artisanal and mechanized fisheries in Kerala. Madras (India), FAO/UNDP Small-Scale Fisheries Promotion in South Asia, 113p. 6 ref. Working paper n° 34. RAS/77/044.

Presents the results of a survey conducted in Kerala, India, in 1980/81. Points covered are the background of Kerala fishing and its characteristics; the methodology of the study; fishing activity during the study period; details of productivity, costs, earnings, and the profitability of various craft-gear combinations.

68. **LAWSON, R.M.,** 1984 Economics of fisheries development. London, Pinter, 283p.

Intended to provide development economists with an introduction to fisheries economics and thus a view to management and exploitation of the developing countries' EEZs. Includes

sections on: the state of world fisheries; economic theory of fish resource exploitation; fisheries management; economics of the fish market; fish marketing and processing; planning for fisheries development; institutional arrangements for developing EEZs; projects for fisheries development; development opportunities.

69. **L'HEUREUX, R.,** 1985 Economic feasibility of fish culture in Zambia. Rome, FAO, 99p. TCP/ZAM/4405(A).

This report assesses the economic feasibility of different fish-farming options in Zambia. The report is based on the results obtained at the existing pilot fish farms at Chilanga and Mwekera; details of costs at these farms are given. One of the most attractive options is fish farming associated with animal husbandry like pig or duck raising, which provides free fertilizer for the ponds.

70. **LIETAR, C.,** 1983 Analyse de la rentabilité financière du fonctionnement de la station piscicole de la Landjia, Bangui, République centrafricaine, Ministère des eaux, forêts, chasse, pêche et tourisme, 59p. FAO/UNDP Projet CAF/80/002. Note technique n° 11.

Examines the financial situation of the aquaculture farm at Landjia, Bangui, Central African Republic. Presents all items of costs and returns. The farm produces fish (Tilapia nilotica), pigs (large white), and ducks. The most cost-effective of these items to produce is fish followed by pigs; though in terms of pure profit it is ducks that yield most followed by pigs and fish.

71. **LIETAR, C.,** 1984 Rentabilité d'une ferme piscicole commerciale en République centrafricaine. Haut Commissariat chargé des eaux, forêts, chasse, pêche et tourisme. Bangui, République centrafricaine, 46p. FAO/CAF/80/002. Document technique n° 18.

Examines the profitability and projected costs and earnings of a commercial fish farm in the Central African Republic. Considers three types of fish culture: monoculture of Tilapia nilotica; monoculture of Clarias lazera; polyculture of T. nilotica with C. lazera. Makes recommendations on the type of fish culture for different areas and conditions.

72. **LIBRERO, A.R., D. RAMOS & L. LAPÌE,** 1982 Fish capture technology: its relationship to productivity, income and employment in the Philippines. Fisheries Research Journal of the Philippines, 7(2):1-20.

Presents the results of a survey of 506 municipal fishermen. The survey, conducted in eight regions of the Philippines, examined the productivity and costs and returns for various types of boat, motorization and types of fishing gear.

73. **LINAZA, J.C. & L.W. GONZALEZ CABELLOS,** 1988 Descriptión de la pesquería de Altura del Pargo del Estado Nueva Esparta, Venezuela. Contribuciones Cientifícas, n° 17, 86p. Es., En.

Examines the main aspects of the structural and socio-economic organization of the offshore snapper fishery in the State of Nueva Esparta, Venezuela. The costs and earnings of this type of fisheries were compared to those of shore and coastal fishermen.

74. **LITTLE, D., M. SKLADANY & R. RODE,** 1987 Smalle-scale hatcheries in north-east Thailand. Aquaculture and Fisheries Management, 18(1):15-31. 9 ref.

The development of small-scale hatcheries is placed in perspective with other commercial methods of fish seed production, private and public, in the north-east region of Thailand. Case studies of six small-scale hatcheries operated by farmers in this region are presented with details of production, costs and returns of these farms in relation to their size, location, species of fish produced, amount of capital invested and marketing and sales strategies.

75. **MAMMO, M.,** 1987 Study on income, indebtedness and savings among fisherfolk of Orissa, India. Madras, FAO/SIDA, 26p. GCP/RAS/040/SWE. BOBP/WP/55.

A savings project from the Bay of Bengal Programme - Development of Small-Scale Fisheries - presents the findings of a study on ownership, income, indebtedness and savings patterns in two fishing villages in Orissa: Udayapur and Gopalpur.

76. **MATSURA, Y.,** 1981 Análise econômica da produção da sardinha na regiao sudeste do Brasil: Boletim do Instituto Oceanográfico, 30(1):57-64. Pt., En.

A surplus-yield model of Schaefer was used to study a maximum sustainable of the Brazilian sardine. Applying the price of sardine and the operation costs, an economic yield of sardine was discussed.

77. **McCOY, M.,** 1988 Report on operations of FV "KIMEJI", Pohnpei, Federated States of Micronesia 1983/86. SPC Fisheries Newsletter, 45:24-36. En., Fr.

Describes the practicality and economic feasibility of operating an economical diesel-powered launch in the local fisheries of Pohnpei and the Federated States of Micronesia. This report is the result of activity carried out over a four-year span, 1983/86. Details of earnings and variable and fixed expenses are considered.

78. **MELTZOFF, S.K. & E.S. LI PUMA,** 1983 A Japanese fishing joint venture: worker experience and national development in the Solomon Islands. ICLARM Technical Reports 12, 63p. 51 ref.

Describes the first decade (1971/1981) of a joint-tuna-fishing venture between Talya Gyogyo of Tokyo, the largest fishing company in the world, and the Solomon Islands Government. The economics of both countries' contributions to the joint venture are examined.

79. **MEROLA, N. & F.A. PAGAN-FONT,** 1988 Pond culture of the Amazon fish tambaqui, Colossoma macropomum: A pilot study. Aquacultural Engineering, 7(2):113-25. 15 ref.

Describes a pilot study of pond culture of the Amazon fish tambaqui (an FAO Project). A cost-return analysis shows the net returns to capital, land and management.

80. **MIDDENDORP, A.J. & J.A.J. VERRETH,** 1986 The potential of and constraints to fish culture in integrated farming systems in the Lam Pao Irrigation Project, North-East Thailand. Aquaculture, 56(1):63-78.

In an irrigated area of the Lam Pao region, North-East Thailand, a survey was carried out to assess the economic potential of and the constraints to fish culture on small farm holdings. Operating costs and financial returns of the various options are reviewed.

81. **MILLET, C.A.,** 1988 Le poisson dans l'alimentation nationale: position et perspectives. Rome, FAO, 73p. FI:DP/ZAI/84/015. Document de travail n^0 2.

Analyzes the role of fish in the national diet of Zaire. Compares the price of fish and fishery products to those of animal protein, for example, poultry. Also considers imports credit and planning policy.

82. **MINISTRY OF NATURAL RESOURCES,** 1983 Bureau of Fisheries and Aquatic Resources and South China Sea Fisheries Development and Coordination Programme, Socio-economic and Marketing Study of Municipal Fishering Households, Bayawan, Negros Oriental, Philippines. Manila, Philippines, Bureau of Fisheries and Aquatic Resources and the FAO South China Sea Fisheries Development and Coordination Programme, 94p. SCS/83/WP/121.

Examines the socio-economic profile of municipal fishermen and fry gatherers and their households, costs and returns of fishing operations and fish marketing practices.

83. **MLAY, M.L. & J. MAKENE,** 1986 Fish handling and distribution in Tanzania. In Proceedings of the FAO Expert Consultation on Fish Technology in Africa. Lusaka, Zambia, 21-25 January 1985. FAO Fisheries Report, (329)Suppl.:13-22.

Describes fish resources, fish handling on-board vessels of different sizes, and fish handling and distribution at landing sites and rural and urban markets. Financial constraints regarding fish handling and distribution are given.

84. **MOHAN RAJAN, K.V.,** 1982 A success story of deployment of mechanized boats for shark longlining. Seafood export Journal, 14(8):9-15.

The poor financial returns from fishing operations by mechanized boats in Thootur village, Tamil Nadu, India, are examined. Recommends diversification in fishing methods so boats do not lie idle. An example of this diversification is described at Thootur village, Tamil Nadu, where not less than 30 mechanized

boats have successfully switched to shark fishing with longlines during certain seasons of the year.

85. **MOYA, R. & J.J. MORALES,** 1984 Un lento repunte. Tecnica Pesquera, 197:13-18. Es., En.

Examines the state of tuna fish production in México. The report examines tuna scarcity, credit restrictions, devaluation and operation costs and their role in the industry's poor performance.

86. **MSISKA, O.V.,** 1988 Aquaculture and rural development in Malawi. In Report of a technical consultation on aquaculture in rural development, Lusaka, Zambia, 27-30 October 1987. Rome, FAO, p.75-84. 9 ref. GCP/INT/436/SWE/REP/2.

The state of aquaculture and rural development in Malawi is discussed. Tables provide details of cost and revenues of various fish-farming projects.

87. **NIKIJULUW, V.,** 1985 Analisa biaya dan penerimaan jaring udang di kabupaten Batang, Jawa Tengah. (Costs and returns analysis for trammel-netters in Batang regency, Central Java). Laporan Penelitian Perikanan Laut (Marine Fisheries Research Report), 32:19-31. In., En.

Presents a study of costs and returns for trammel-netters in Batang regency, Central Java. The study took place in September/December 1984 and January 1985. Results of this study are provided, and share production between owner and fishermen was also discussed.

88. **NYANTENG, V.K.,** 1981 Trends in fish prices and implications for the development of the Ghanaian fishing industry. FAO/UNDP Interregional Fisheries Development and Management Programme INT/79/019/CE. Rome, FAO, 34p. CECAF/TECH/81/33 (En).

Presents a report on the development of the Ghanaian fishing industry. The study is divided into six sections: the introduction; a discussion on the consumption and supply of fish and other sources of animal foods including redmeat, poultry, game, eggs and milk; a discussion on development in the fishing industry; a comparison of fish prices and consumption with those of competing sources of animal protein; a discussion of the trends in fish prices and other sources of animal protein; and the role of prices in the development of the fishing industry.

89. **OMAR, I.H.,** 1983 Malaysian trawlers: economics of vessel size. Marine Policy, 7(3):220-22. 7 ref.

Focuses on the economics of trawling in a location-specific fishery that is affected by seasonal monsoons. Both field evaluations and econometric models are used to determine the economic performances of trawlers of different tonnages. The findings indicate that in a multispecies monsoon-affected fishery medium-sized vessels in the category of 20-30 tons were the most cost efficient.

90. **PANAYOTOU, T.** (ed.), Small-scale fisheries in Asia: socio-economic analysis 1985 and policy. IDRC publication, 229(E):283p.

Describes and analyzes the socio-economic conditions of small-scale fishermen in Bangladesh, Malaysia, the Philippines, Sri Lanka and Thailand in order to evaluate government policies and propose policy alternatives. Productivity and economic efficiency, cost structure and profitability, marketing, social and institutional constraints and government programmes are reviewed.

91. **PANAYOTOU, T. & S. JETANAVANICH,** The economics and management of Thai marine 1987 fisheries. ICLARM Studies and Reviews 14, 82p.

Examines the economic situation of the Thai marine fisheries citing its particular relevance to developing countries of developing large-scale fisheries in their respective areas. Documents the profitability of trawl fishing; the poverty of small-scale fishermen; the heavy overfishing of the Gulf of Thailand and the management and enforcement capabilities of Thailand and her neighbours. The study also discusses the state of joint ventures and the EEZ.

92. **PICHAY, L.B.,** The impact of rising fuel costs on municipal fisheries. 1980 Fisheries Today, 3(2):6-7.

The comparative wholesale prices and percentage increases of regular gasoline and diesel in the Philippines are listed from 1972 to 1980. Likely effects and implications of the seventies oil crisis on the fishing industry are discussed.

93. **POLLNAC, R.B., S. PETERSON & L.J. SMITH,** Elements in evaluating success and 1982 failure in aquaculture projects. In Aquaculture development in less developed countries: social, economic and political problems, edited by L.J. Smith and S. Peterson. Colorado (USA), Westview Press, p.131-43. 12 ref.

Examples from projects in Latin America and Africa are used to describe the general requirements of aquaculture development, decision points in a development project, and evaluations of success or failure by the personal funding agencies. The report discusses various cost/benefit analyses involved, including a cost/benefit analysis of aquaculture versus other animal protein sources such as catlle, pigs, and chicken.

94. **POLLNAC, R.B.,** Income variability, uncertainty, and investment orientations 1989 among small-scale fishermen in the Gulf of Nicoya, Costa Rica. In Aspects of Small-scale fisheries development. Rhode Island (USA), ICMRD - International Centre for Marine Resource Development - p.53-73. 33 ref.

Examines investment orientations and their socio-cultural correlates among small-scale fishermen in the Gulf of Nicoya, Costa Rica.

95. **PURUSHAN, K.S.,** 1987 Economics on traditional prawn farming in Kerala, India. Seafood Export Journal, 19(4):15-19.

Presents an economic analysis of the traditional paddy field prawn culture in Kerala, India. Provides details of costs and profits on such farms.

96. **RAJBANSHI, K.G. & M.B. SHRESTHA,** 1980 A case study on the economics of integrated farming systems: Agriculture, aquaculture and animal husbandry in Nepal. In Integrated agriculture/aquaculture farming systems: proceedings of the ICLARM - SEARCA Conference on Integrated Agriculture/Aquaculture Farming Systems, Manila, Philippines, 6-9 August 1979. ICLARM Conference Proceedings 4, edited by R.S.V. Pullin and Z.H. Shehadeh, Manila, Philippines, ICLARM and Southeast Asian Regional Centre for Graduate Study and Research in Agriculture, p.195-208.

Presents a two-year case study of a small Nepali farm 14 km east of Kathmandu. In the first year the farmer concentrated on cereal crops while in the second year he added a piggery, and combined duck raising with fish culture. Detailed economics are given for both years on a product by product basis.

97. **RAJBANSHI, K.G.,** 1987 Selection of sites for the development of low-cost fish farming. Rome, Italy, FAO. 10p. FI:TCP/PAK/6760. Field Document 1.

Report from a project in Pakistan (TCP/PAK/6760) whose main objective is to transfer fish culture knowledge in rural areas of Islamabad Capital Territory by establishing three demonstration sites of low-cost fish farms. This report summarizes the observations on the present situation and problems of fish culture, and presents guidelines for the implementation of the project.

98. **REDDI, D.V.,** 1980 Economics of shrimp farming in Kakinada Area. In Short-Term Training Programme in brackish water prawn and fish culture, Kakinada, India, 8-30 September 1980. Bombay, India, Central Institute of Fisheries Education (Indian Council of Agricultural Research), p.121-23.

Examines the economic viability and technical feasibility of shrimp/prawn and fish farming in Kakinada Area, India. All major items of expenditure are taken into account.

99. **ROY, R.N.,** 1985 Pen culture of shrimp in the backwaters of Killai, Tamil Nadu: a study of techno-economic and social feasibility. Madras, India, FAO/UNDP Bay of Bengal Programme: development of small-scale fisheries, 34p. BOBP/WP/32. GCP/RAS/040/SWE.

Presents the findings and recommendations of a techno-economic and social feasibility study of shrimp pen culture in the backwaters of Killai, Tamil Nadu, India. These are based on field surveys in the communities of the region in the latter

half of 1983 and on three culture trials at Killai, undertaken during an earlier twenty-one month technical programme conducted by BOBP and the Department of Fisheries, Government of Tamil Nadu.

100. **SADANANDAN, K.A., et al.,** 1988 Economics of gillnetting and two-boat midwater trawling. Fishery Technology, 25(1):5-7. 2 ref.

The paper deals with the economic aspects of the operation of gillnetting and two-boat midwater trawling conducted off Cochin, India. Presents the respective profitability of both types of gear using data collected in 1979 and from 1980-1981.

101. **SAHA, R.K., M.M. RAHMAN & M.M. ISLAM,** 1985 An economic investigation into pond fish farming under different management types in an area of Bangladesh, Economic Affairs, 30(2):105-14. 5 ref.

The investigation was designed to evaluate the performance of pond fish farming at the village level. More specifically, the aim of the study was to: work out cost and return per acre of pond fish culture; identify the factors responsible for variations in productivity; discuss the general as well as specific problems of pond fish culture; and make policy recommendations.

102. **SAMSON, E.D.,** 1983 Joint fishing ventures: a third model for Southeast Asia. Querzon City, Philippines, Fishery Industry Development Council, 30p. FIDC Technical Report Series 3.

Examines the rationale for, and the economic feasibility of a cooperative undertaking in fishing between two or more countries in Southeast Asia, from the point of view of the production aspects only.

103. **SAMUEL, A.D.V.,** 1989 Economics of marine fishing and role of fisherwomen in Tirunelveli District in Tamil Nadu. Fishing Chimes 9(7):55-63. 5 ref.

Reports on a study in Tamil Nadu, India, which analyzed the costs and returns, economic efficiency, and pattern of labour use among the artisanal and mechanized fishing crafts; and studies the role of fisherwomen in decision making.

104. **SATHIADHAS, R. & K.K.P. PANIKKAR,** 1988 Socio-economics of small-scale fishermen with emphasis on costs and earnings of traditional fishing units along Trivandrum Coast, Kerala - a case study. Seafood Export Journal, 20(11):21-36. 8 ref.

Presents details of a case study conducted in Poonthura, a major fishing village in the Trivandrum district of Kerala State, India. It examines the socio-economic status of the sector;

analyzes the details of costs and earnings of different fishing techniques and systems; identifies the major socio-economic constraints to fishery development and assesses the impact of new innovations and improved techniques on traditional fishing.

105. **SATHIADHAS, R., K.K.P. PANIKKAR, U.K. SATYAVAN & T. JACOB,** 1989 Economic evaluation of paddy-prawn integrated farming in Kerala. Seafood Export Journal, 21(11):9-21. 15 ref.

Presents the results of a research project sponsored by the Central Marine Fisheries Research Institute (CMFRI). The project was established to study the economics of traditional paddy-cum-prawn practices in Kerala State, India. Tables provide details of the various costs and returns of such systems.

106. **SATHIADHAS, R. & R.E. BEAJAMIN,** 1990 Economics of mechanized fishing units along Tamil Nadu Coast. Seafood Export Journal, 22(1):15-30. 9 ref.

This study deals with the economics of trawlwers and gillnetters operating at selected centres of Tamil Nadu Coast, India. Tables provide details of catch composition, and income and expenditure of the fishing units along Tamil Nadu Coast.

107. **SCHMIDT, U.W.,** 1980 Integrated aquaculture in West Java. A socio-economic study of integrated farming of fish, livestock and crops by small farmers in West Java, Indonesia. Rome, FAO/UNDP Aquaculture Development and Coordination Programme, 21p. 10 ref. ADCP/MR/80/11/E.

Reviews the state of present practices of farming fish, livestock and crops in West Java from the socio-economic point of view providing details of costs and benefits. Evaluates the economic potential and feasibility for future development.

108. **SCHMIDT, U.W. & M.M.J. VINCKE,** 1981 Aquaculture development in Rwanda - Feasibility of small-scale rural fish farming. Rome, FAO/UNDP Aquaculture Development and Coordination Programme, 69p. ADCP/MR/81/12/E.

Discusses the technical, economic, social and financial feasibility of small-scale rural fish farming enterprises in Rwanda and the factors inhibiting higher productivity and expansion; it also indicates the nature and amount of inputs required to carry out an effective programme aimed at a significant increase in supplies at acceptable costs.

109. **SEHARA, D.B.S. & J.P. KARBHARI,** 1989 Gillnet fishing by mechanized boats at selected centres in Maharashtra and its profitability. Seafood Export Journal, 12(12):10-23.

The present study was carried out by the Central Marine Fisheries Research Institute, Cochin, India. It was aimed at estimating the profitability of gillnet fishing by mechanized boats - accounting for about 90% of total marine fish landings - in two coastal districts of Maharashtra, an important Indian maritime state.

110. **SEVILLEJA, R.B.,** 1982 Economic analysis of integrated pig/fish farming operations in the Philippines. In Aquaculture Economics Research in Asia: Proceedings of a workshop held in Singapore, 2-5 June 1981. Ottawa, Canada, IDRC, p.75-81, IDRC 193e

Based on fish yields from experimental pig/fish trials the feasability of integrating fish with backyard and commercial pig operations is analyzed. The operating costs and returns from differents types of integrated pig/fish farming systems are discussed using three case studies as a model.

111. **SHANG, Y.C.,** 1984 Economic aspects of aquafarm construction and maintenance. In Inland Aquaculture Engineering: lectures presented at the ADCP Inter-Regional Training Course in Inland Aquaculture Engineering, Budapest, Hungary, 6 June/3 September 1983. Rome, FAO. p.539-50. 3 ref. ADCP/REP/84/21.

This paper analyzes the technical, economic and social feasibility of aquacutlure construction. It stresses the importance of site selection for the operating efficiency of an aquafarm. All economic factors (indicators) including costs and returns are considered.

112. **SHANK, M.D. & J.G. SUTINEN,** 1981 An economic analysis of fish marketing in El Salvador. In Small-Scale Fisheries in Central America: acquiring information for decision making, edited by J.G. Sutinen and R.B. Pollnac. Rhode Island, USA, ICMRD, p.393-422. 9 ref.

This study evaluates the market structure and performance of the wholesale merchant sector of the public fresh fish marketing system in El Salvador. The study identifies the major market structure elements which influence the level of competition among the primary buyers, transporters, and wholesalers which make up the wholesale market sector. The average marketing costs of the collective wholesale merchant sector are calculated and average marketing cost and average total cost are estimated.

113. **SHEVES, G.T.,** 1987 Save on fuel costs with diesel engine: provisional results of motorization programme in traditional canoes. IDAF Newsletter, 6:17-22. En., Fr.

The provisional results of a motorization programme of traditional canoes in Benin are presented. The potential savings on fuel costs of such a programme are outlined: results show a marked saving for diesel-powered pirogues over pirogues powered with the traditional outboard engine.

114. **SIAW-YANG, Y, ONG-HEAN TATT & LIM KEM-SENG,** 1989 Formulation of aquaculture development at an ox-bow lake in Malaysia: Economic feasibility analysis. Aquaculture and Fisheries Management, 20(4):427-39. 9 ref.

Summarizes the economic aspects of production models and discusses the economic feasibility and some marketing requirements of a proposed fisheries/aquaculture project at an ox-bow lake, isolated from the Perak River, at Teluk Intan, Perak, Malaysia.

115. **SIGNEY, L.O.,** 1987 Consequences of excessive fishing effort on economic aspects in Lingayen Gulf, Philippines. In Papers presented at the Symposium on the Exploitation and Management of Marine Fishery Resources in Southeast Asia, Darwin, (Australia), 16-19 February 1987. Bangkok (Thailand), FAO Regional Office for Asia and the Pacific, p. 208-17, RAPA Report 1987/10.

Analyzes the problem of overfishing in Lingayen Gulf, Philippines. The possibilities of profitability under such circumstances are examined as well as the effect of rising costs.

116. **SILAS, E.G.,** 1982 The deep question: can culture overcome energy costs? Fishing Chimes, 2(6):17-25.

Discusses the various economic constraints on the exploitation of marine fishery resources in India - especially energy costs. Considers the question of whether deep-sea fishing should be invested in on a large scale or whether priority should change to aquaculture. Concludes that deep-sea fishing still has an important part to play in the Indian economy.

117. **SMITH, I.R.,** 1985 Research issues in aquaculture economics. ICLARM Newsletter, 8(2):7-8.

Discusses the rapid increase in aquaculture production in South-East Asia but stresses that research is needed in two major areas - adequate seed supply and consistent species quality; and a fair distribution of the potential financial benefits to the beneficiaries (and the losers) of this expansion of aquaculture.

118. **SUBBA RAO, D.V. & K.R. CHOWDRY,** 1988 An economic analysis of investment structure and financing of inland fish farming in Andhra Pradesh. Agricultural Situation in India, 17(12):1081-86.

An economic analysis of inland fish farming in Andhra Pradesh, India is presented. The objectives of the study were: to calculate the fixed investment on various components for establishing fish seed and culture farms of different size groups; to calculate the capital requirements for meeting the operational expenses of different farm types and sizes; to determine the gross and net returns as well as the rate of return on rupee investment; to suggest the scale of finance for establishing fish seed and culture farms; and to provide suggestions for improving the efficiency and profitability of fish farms.

119. **SUMITRA-VIJAYARAGHAVAN,** et al., 1981 Aquaculture of Pearl Spot (Etroplus suratensis) in an estuarine pond: environmental characteristics primary production, growth and cost-benefit ratio. Indian Journal of Marine Sciences, 10(1):82-89. 18 ref.

Presents the fish production rate, costs of production and the rate of return on investment of the aquaculture of Etroplus suratensis in India. Various methods of increasing fish yield are suggested: the use of fertilizers and the incorporation of animal protein in the supplemented feed.

120. **TAN, E.S.P. & K.H. KHOO,** 1980 The integration of fish farming with agriculture in Malaysia. In Integrated agriculture-aquaculture farming systems: proceedings of the ICLARM/SEARCA Conference on Integrated Agriculture/Aquaculture Farming Systems, Manila, Philippines, 6/9 August 1979. ICLARM Conference Proceedings 4, edited by R.S.V. Pullin and Z.H. Shehadeh, Manila, Philippines, ICLARM and Southeast Asian Regional Centre for Graduate Study and Research in Agriculture, p.175-87. 17 ref.

Reviews the status of freshwater aquaculture in Malaysia with special reference to integrated farming. Detailed economic case studies of pig/fruit/vegetable/fish, pig/fish, and pig/poultry/fish farms are presented. The paper also identifies the main problems associated with integrated farming in Malaysia.

121. **TANIMOMO, P.,** 1986 Gillnets for coral bottoms. IDAF Newsletter, 4/5:28-32. En., Fr.

Describes the use of one of the most common fishing gears in Benin: the bottomset gillnet called "tohunga". The "tohunga" is compared to a Danish gillnet, which though more expensive, would allow fishermen to diversify their fishing grounds to include rocky bottoms, and thus increase their production and earnings. The results of trials made with the new type of gillnet and the relative costs of both types of gillnet are presented.

122. **TETTEY, E.O. & W.L. GRIFFIN,** 1984 Investment in Gulf of Mexico shrimp vessels 1965/1977. Marine Fisheries Review, 46(2):49-52.

Examines implications of investment patterns in the Gulf shrimp fishery. Historical trends in capital stock of vessels are estimated for 1965/77 for different types of vessels to use for landings and sales data. Discusses whether the value of landings was greater than production costs thereby leading to a bigger incentive for investment.

123. **TETTEY, E.O.,** 1988 The economics of Nile perch processing and distribution in Kenya. Abidjan (Côte d'Ivoire). FAO, 33p. FI/GCP/KEN/055/NET.

This study evaluates the economic feasibility of processing options for Nile perch in Kenya. It provides details of the production costs and returns of the various options. It also presents data on market demand (national and export), prices and trends of Nile perch products.

124. **TETTEY, E.O. & J. BON,** 1989 Nile perch: a new economic force. INFOFISH International, 1:12-14.

Using experimental results obtained from an FAO project in Kenya (GCP/KEN/055/NET), the article examines the economic feasibility

of several processing options for Nile perch. Also discussed the domestic and export market for Nile perch products. Financial analyses of these options are presented giving an indication of the most profitable options.

125. **TIENSONGRUSMEE, B.,** 1982 Design of small-scale shrimp/prawn hatcheries suitable for developing countries in Southeast Asia: Based on a model design for a freshwater prawn hatchery used by Majuikan in Malaysia. In Working Party on Small-Scale Shrimp/Prawn Hatcheries in Southeast Asia, Semarang, Central Java, Indonesia, 16-21 November 1981, Technical Report, Manila, Philippines, South China Sea Development and Coordination Programme, p.45-51. SCS/GEN/82/40.

Examines a model design for a freshwater shrimp/prawn hatchery (currently used by Majuikan in Malaysia) and its suitability for developing countries in Southeast Asia. An analysis of its construction and the costs involved in its development are outlined.

126. **TUGSINAVISUITTI, S. & T. ONCHAN,** 1979 Economics of aquaculture in Thailand: a case study of catfish production. In Economics of aquaculture, seafishing and coastal resource use in Asia. Proceedings of the Second Biennial Meeting of the Agricultural Economics Society of Southeast Asia, 3-6 November 1977, Tigbauan, Iloilo, Philippines, edited by A.R. Librero and W.L. Collier. Iloilo (Philippines), Philippine Council for Agriculture and Resources Research, p. 71-79.

This study examines: the socio-economic conditions of the fish farmers; costs and returns of fish production; and factors that affect the production and distribution of fish. This study only covers catfish, which is of particular economic and commercial importance in Thailand.

127. **TULAY, E. & I.R. SMITH,** 1982 Costs and returns of mini trawlers. In Small-scale fisheries of San Miguel Bay, Philippines: economics of production and marketing, edited by I.R. Smith and A.N. Mines. ICLARM Technical Reports, 8:64-77.

Mini trawlers are the smallest trawlers operating in San Miguel Bay, Philippines. The costs and returns of this type of gear are examined; explanations are given for the high pure profits earned.

128. **VINCKE, M.M.J. & U.N. WIJKSTRÖM,** 1982 Notes sur l'économie de l'aquaculture en Côte d'Ivoire: rapport d'une mission en Côte d'Ivoire. Rome, FAO, 70p. ADCP/MR/82/19.

Presents an economic analysis of aquaculture, particularly in freshwater ponds, in Côte d'Ivoire. Makes appropriate recommendations for the developpement of aquaculture.

129. **WAI-CHING SIN, A.,** 1980 Integrated animal/fish husbandry systems in Hong Kong with case studies on duck/fish and goose/fish systems. In Integrated agriculture/aquaculture farming sytems: Proceedings of the ICLARM/SEARCA Conference on Integrated Agriculture/

Aquaculture Farming Systems, Manila, Philippines, 6/9 August 1979. ICLARM Conference Proceedings 4, edited by R.S.V. Pullin and Z.H. Shehadeh. Manila, Philippiens, ICLARM and South-East Asian Regional Centre for Graduate Study and Research in Agriculture, p.113-23. 12 ref.

Reviews the various combinations of pig, duck, goose, pigeon and fish farming in Hong Kong with emphasis on production data and marketing. The paper presents two economic case studies of duck/fish and goose/fish farms showing the costs and earnings of such systems.

130. **WATTANUTCHARIYA, S. & T. PANAYOTOU,** the economics of aquaculture: the case 1982 of catfish in Thailand. In Aquaculture Economics Research in Asia: proceedings of a workshop held in Singapore, 2/5 June 1981. Ottawa, Canada, IDRC, p.26-34. IDRC 193e.

After a brief introduction to catfish farming in Thailand, this paper deals with cost structure, profitability and production technology. The emphasis is on the dominance of feed, and particularly trash fish, in the cost structure and the profit differential between small and large farms experienced and inexperienced farmers.

131. **WILLMANN, R. & B. FRIELINK,** The shrimp fishery of Sierra Leone. Programme 1987 for the development of fisheries in the Eastern Central Atlantic, Dakar, Senegal, FAO, 27p. CECAF/TECH/87/79.

Describes the work undertaken by an FAO team working with the CECAF Programme to study the development and management of the industrial shrimp fisheries of Sierra Leone. All aspects of the shrimp fishery are discussed: revenues, resources, costs, profitability and optimal fleet size.

132. **WRIGHT, N.A. & D.H.S. KENMUIR,** The economics of fish culture. A survey of 1981 costs associated with tilapia (Sarotheron mossambicus) production, Zimbabwe Agricultural Journal, 78(4):151-59. 28 ref.

This paper aims to provide farmers in Zimbabwe with a budgetary aid which can be used to appraise the economic viability of S. mossambicus production. Details of costs and returns are provided.

133. **YOUSIF, O.M.,** Tilapia culture in Sudan. NAGA, 10(1):p.13. 1987

Reviews the state of tilapia culture in the Sudan; the article identifies the factors responsible for the unprofitability and unpopularity of the present method of tilapia culture.

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